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Affiliated subspaces and infiniteness of von Neumann algebras

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Abstract

We show that the structural properties of von Neumann algebra s are connected with the metric and order theoretic properties of various classes of affiliated subspaces. Among others we show that properly infinite von Neumann algebra s always admit an affiliated subspace for which (1) closed and orthogonally closed affiliated subspaces are different; (2) splitting and quasi-splitting affiliated subspaces do not coincide. We provide an involved construction showing that concepts of splitting and quasi-splitting subspaces are non-equivalent in any GNS representation space arising from a faithful normal state on a Type I factor. We are putting together the theory of quasi-splitting subspaces developed for inner product spaces on one side and the modular theory of von Neumann algebra s on the other side. © 2013 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

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Keywords

GNS representation, Quasi-splitting subspaces, Subspaces affiliated with a von Neuman algebra, Subspaces in pre-Hilbert spaces